

- 28 -

Claims

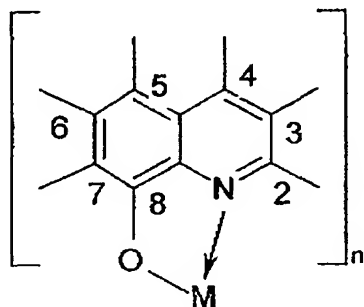
1. An electroluminescent compound of formula $M(L)_n$ or $MO(L)_{n-2}$ where M is a metal in a valency state n of greater than 3 and L is an organic ligand; the ligands L can be the same or different.
2. An electroluminescent compound as claimed in claim 1 of formula $M^{(iv)}(L_1)(L_2)(L_3)(L_4)$, $M^{(iv)}O(L_1)(L_2)$, $M^{(v)}(L_1)(L_2)(L_3)(L_4)(L_5)$, $M^{(v)}O(L_1)(L_2)(L_3)$.
3. An electroluminescent compound as claimed in claim 1 or 2 in which the metal M is titanium, zirconium or hafnium in the four valency state or vanadium, niobium or tantalum in the five valency state.
4. An electroluminescent compound as claimed in claim 1 of formula of figs. 1a to 1d.
5. An electroluminescent compound as claimed in claim 1 of formula $M(L_1)(L_2)(L_3)(L_4)$ or $MO(L_1)(L_2)$ where the groups (L_1) , (L_2) , (L_3) and (L_4) are the same or different where M is zirconium, hafnium or titanium in the four valency state.
6. An electroluminescent compound as claimed in claim 1 of formula $M(L_1)(L_2)(L_3)(L_4)(L_5)$ or $MO(L_1)(L_2)(L_3)$ where the groups (L_1) , (L_2) , (L_3) and (L_4) (L_5) are the same or different where M is vanadium, niobium or tantalum in the five valency state.
7. An electroluminescent compound as claimed in any one of the preceding claims in which the ligands L are selected from ligands (I) to (XVIII) herein.

- 29 -

8. An electroluminescent compound as claimed in any one of the preceding claims in which the ligands L are selected from quinolates, porphyrins, pyrazalones, and β -diketones.

5 9. An electroluminescent compound as claimed in any one of the preceding claims in which the ligands L is dibenzoyl methane.

10. An electroluminescent compound of formula



10 where M is the metal selected from titanium, zirconium or hafnium in the four valency state or vanadium, niobium or tantalum in the five valency state, n is the valency state of the M and where the substituents are the same or different in the 2, 3, 4, 5, 6 and 7 positions.

15 11. An electroluminescent compound as claimed in claim 11 in which the substituents are selected from alky, alkoxy, aryl, aryloxy, sulphonic acids, esters, carboxylic acids, amino and amido groups or are aromatic, polycyclic or heterocyclic groups.

12. An electroluminescent compound as claimed in claim 10 in which the complex is
20 a 2-methyl or 5-methyl metal quinolate.

13. An electroluminescent composition which comprises an electroluminescent compound as claimed in any one of claims 1 to 12 and a dopant comprising a fluorescent material.

- 30 -

14. An electroluminescent composition as claimed in claim 13 in which the dopant is selected from diphenylacridine, coumarins, perylene, quinolates, porphoryin, porphines, pyrazalones and their derivatives.
- 5 15. An electroluminescent composition as claimed in claim 13 or 14 in which there is up to 10 mole percent fluorescent material, based on moles of organo metallic complex.
- 10 16. An electroluminescent composition as claimed in claim 13 or 14 in which there is up to 1 mole percent fluorescent material, based on moles of organo metallic complex.
- 15 17. An electroluminescent composition as claimed in claim 13 or 14 in which there is less than 10^{-3} mole percent fluorescent material, based on moles of organo metallic complex.
- 20 18. An electroluminescent composition as claimed in any one of claims 13 to 17 in which the dopant is selected from compounds of formula (A), (B) and (C) and compounds of figures 9 to 13 of the drawings.
- 25 19. An electroluminescent device which comprises (i) a first electrode, (ii) a layer of electroluminescent compound or composition as claimed in any one of claims 1 to 18 and (iii) a second electrode.
- 30 20. An electroluminescent device as claimed in claim 19 in which there is a layer of a hole transmitting material between the first electrode and the electroluminescent layer.
21. An electroluminescent device as claimed in claim 20 in which the hole transmitting material is an aromatic amine complex.

- 31 -

22. An electroluminescent device as claimed in claim 20 in which the hole transmitting material is a polyaromatic amine complex.
- 5 23. An electroluminescent device as claimed in claim 20 in which the hole transmitting material is a film of a polymer selected from poly(vinylcarbazole), N,N'-diphenyl-N,N'-bis (3-methylphenyl) -1,1' -biphenyl -4,4'-diamine (TPD), polyaniline, substituted polyanilines, polythiophenes, substituted polythiophenes, polysilanes and substituted polysilanes.
- 10 24. An electroluminescent device as claimed in claim 20 in which the hole transmitting material is a film of a compound of formula (XIX) or (XX) herein or as in figures 4 to 8 of the drawings.
- 15 25. An electroluminescent device as claimed in claim 20 in which the hole transmitting material is a copolymer of aniline, a copolymer of aniline with o-anisidine, m-sulphanilic acid or o-aminophenol, or o-toluidine with o-aminophenol, o-ethylaniline, o-phenylene diamine or with an amino anthracene.
- 20 26. An electroluminescent device as claimed in claim 20 in which the hole transmitting material is a conjugated polymer.
27. An electroluminescent device as claimed in claim 26 in which the conjugated polymer is selected from poly (p-phenylenevinylene)-PPV and copolymers including
- 25 PPV, poly(2,5 dialkoxyphenylene vinylene), poly (2-methoxy-5-(2-methoxypentyloxy-1,4-phenylene vinylene), poly(2-methoxypentyloxy)-1,4-phenylenevinylene), poly(2-methoxy-5-(2-dodecyloxy-1,4-phenylenevinylene) and other poly(2,5 dialkoxyphenylenevinylenes) with at least one of the alkoxy groups being a long chain solubilising alkoxy group, poly fluorenes and oligofluorenes,

- 32 -

polyphenylenes and oligophenylenes, polyanthracenes and oligo anthracenes, ploythiophenes and oligothiophenes.

28. An electroluminescent device as claimed in any one of claims 20 to 28 in which
5 the electroluminescent compound is mixed with the hole transmitting material.

29. An electroluminescent device as claimed in any one of claims 19 to 28 in which there is a layer of an electron transmitting material between the cathode and the electroluminescent compound layer.

10

30. An electroluminescent device as claimed in claim 29 in which the electron transmitting material is a metal quinolate.

15

31. An electroluminescent device as claimed in claim 30 in which the metal quinolate is an aluminium quinolate, zirconium quinolate or lithium quinolate

32. An electroluminescent device as claimed in claim 30 in which the electron transmitting material is of formula $Mx(DBM)_n$ where Mx is a metal and DBM is dibenzoyl methane and n is the valency of Mx .

20

33. An electroluminescent device as claimed in claim 29 in which the electron transmitting material is a cyano anthracene such as 9,10 dicyano anthracene, a polystyrene sulphonate or a compound of formulae shown in figure 2 or 3 of the drawings.

25

34. An electroluminescent device as claimed in any one of claims 29 to 33 in which the electron transmitting material is mixed with the electroluminescent compound.

- 33 -

35. An electroluminescent device as claimed in any one of claims 19 to 34 in which the first electrode is a transparent electricity conducting glass electrode.

36. An electroluminescent device as claimed in any one of claims 19 to 35 in which
5 the second electrode is selected from aluminium, calcium, lithium, magnesium and alloys thereof and silver/magnesium alloys.